If you are using a printed copy of this procedure, and not the on-screen version, then you MUST make sure the dates at the bottom of the printed copy and the on-screen version match.
The on-screen version of the Collider-Accelerator Department Procedure is the Official Version.
Hard copies of all signed, official, C-A Operating Procedures are kept on file in the C-A ESHQ Training Office, Bldg. 911A.

C-A OPERATIONS PROCEDURES MANUAL

5.22 Pre-Beam Magnet and Power Supply Checkout

Text Pages 2 through 12

Attachments

Hand Processed Changes

HPC No.	Date	Page Nos.	Initials

Approved: ***Signature on File*** _____
Collider-Accelerator Department Date
Accelerator Division Head

P. Sampson

5.22 Pre-Beam Magnet and Power Supply Checkout

1. Purpose

The purpose of this procedure is to provide Main Control Room (MCR) operators with instructions for checking out power supplies for the C-A complex.

2. Responsibilities

2.1 The MCR operators are responsible for executing this procedure when instructed to do so.

2.2 The Operations Coordinator (OC) is responsible for insuring the accurate execution of this procedure.

2.3 The OC shall initiate corrective actions to problems encountered during execution. These include:

2.3.1 Informing the appropriate systems specialist of problems,

2.3.2 logging problems in the OC Log,

2.3.3 editing the attachments of this procedure when necessary to reflect any special situations or modifications, and

2.3.4 signing each attachment of this procedure when completed.

2.4 The MCR Group Leader (GL), or Deputy GL, may authorize the omission of sections of this procedure by marking them N/A on C-A-OPM-ATT 5.22.a.

3. Prerequisites

Systems specialists have handed all relevant systems over to the MCR as operational.

4. Precautions

MCR operations will follow all applicable operational safety precautions while completing this procedure.

5. Procedure

5.1 Booster Power Supply Checkout

5.1.1 D.C. supply checkout

5.1.1.1 Turn on devices in BTA and LTB.

5.1.1.2 Load the STORE or otherwise desired values to the devices.

5.1.1.3 Observe the read backs for each device.

5.1.1.3.1 Complete the checkout for the Booster Power Supplies, C-A-OPM-ATT 5.22.b.

5.1.1.3.1.1 List any supplies that do not regulate to within 10% in the comments area (their read backs should appear `red' on `Spreadsheet').

5.1.2 Pulsed Supply Checkout

5.1.2.1 Booster injection bumps

Note:
A Gauss clock must be available to trigger the Fast Bumps.

5.1.2.1.1 Load the STORE or desired function to the injection bumps using the application code `Booster Orbit Control'.

5.1.2.1.2 Connect the analog current signal for each device to a scope.

5.1.2.1.3 Compare the analog signal with the function.

5.1.2.1.3.1 Check the analog signal for oscillations.

5.1.2.1.3.2 Note any oscillations greater than 10% during the collapse of the bump in the comments area provided.

5.1.2.1.4 Load a second known function.

5.1.2.1.5 Observe the analog signal and compare with the loaded function.

5.1.2.1.5.1 Check the analog signal for oscillations and note if there are any greater than 10% while the bump is collapsing.

5.1.2.1.6 Check for cycle-to-cycle consistency by triggering on each of the active cycles.

5.1.2.1.6.1 If changes between active cycles are less than 5%, the bump is operational.

5.1.2.1.7 If [5.1.3.1.5.1] and [5.1.3.1.6.1] are satisfied, then check off the box labeled ok for that bump in C-A-OPM-ATT 5.22.b.

5.1.2.1.8 If [5.1.3.1.7]'s criteria are not satisfied then note observation is the comment area provided.

5.1.2.1.9 Connect the current signals for the injection slow bumps and insure correct operation.

5.1.2.1.9.1 Each waveform shall be a half sine wave, several milli-seconds wide.

5.1.2.1.9.2 All of the waveforms shall be constant for each of the active Booster cycles.

5.1.2.1.10 Complete the appropriate section of C-A-OPM-ATT 5.22.b.

5.1.2.1.10.1 Difference of greater than 5% between cycles indicate a problem. Clearly note any observations of this in the comment area provided.

5.1.2.1.10.2 Extraction bumps and kickers.

Note:
The extraction kickers are synchronized to the rf system. Therefore, the Booster rf must be on and operational before this checkout can be completed.

5.1.2.1.10.2.1 Connect the analog signals for the current for the A5 and F3 kickers to a scope and observe them.

5.1.2.1.10.2.2 The wave form shall be a half sine \ wave nearly 1μ second wide.

Note 1:
Both the F3 and A5 kickers are triggered by nano-second delays from `COGGING.ARM'. These are KDHF3.IO and KDHA5.IO respectively.

Note 2:
Both the F3 and A5 have two modes, one for heavy ion running and one for proton running respectively. Be sure the device is in the proper mode. An indication of mode status is on the spreadsheet.

5.1.2.1.10.2.3 View both the F3 and A5 on the same trace.

5.1.2.1.10.2.4 Check that the delay between the two signals stays constant for each active cycle. Observe many (20) super-cycles to confirm this.

5.1.2.1.10.2.5 Connect the voltage signals to a scope and examine the trace.

5.1.2.1.10.2.5.1 Check that each active cycle is identical to the next.

5.1.2.1.10.2.5.2 Check the voltage goes to zero between the cycles and that there are no holes or sags in the signal prior to discharge.

5.1.2.1.10.2.6 If 5.1.3.1.10.2.1 - 5.1.3.1.10.2.5] are satisfied, then indicate that the device has passed the test criteria in C-A-OPM-ATT 5.22.b.

5.1.2.1.10.2.7 List problems on C-A-OPM-ATT 5.22.b in the comment area provided.

5.1.3 Extraction Bumps

5.1.3.1 Connect each of the four extraction bump's current signals to a scope.

5.1.3.1.1 Check that each is operating.

5.1.3.1.1.1 Each bump shall be a half sine wave milli-seconds in width.

5.1.3.1.1.2 Each bump shall be bipolar (the signal shall invert on the scope for negative commands).

5.1.3.1.1.3 The wave forms shall be constant for each of the active Booster cycles.

5.1.3.1.2 Complete the appropriate section of C-A-OPM-ATT 5.22.b.

5.1.3.1.2.1 Indicate that the bump has passed the tests if 5.1.3.1.10.3.1 are satisfied.

5.1.3.1.2.2 List problems in the comment area provided.

5.1.4 Septa Checkout

5.1.4.1 Connect the current signals for the L20 and F6 septa to a scope and observe the waveform.

5.1.4.1.1 The signal shall be a half sine wave several milli-seconds wide.

5.1.4.1.2 Trigger the scope with all active cycles and check that the septa are invariant over these cycles.

5.1.4.2 Connect the voltage (charging) signals for F6 and L20 and examine the waveform.

5.1.4.2.1 Insure that there are no irregularities in the waveform.

5.1.4.2.2 Trigger the scope with all active cycles and check that the septa are invariant over these cycles.

Note:
Differences of 5% or more in amplitude between active cycles for the L20 or F6 septa indicates a problem that shall be clearly noted in the comments section provided.

5.1.4.2.3 Complete the checkout for the septa in C-A-OPM-ATT 5.22.b.

5.1.4.3 Booster Stopband Correction Checkout

5.1.4.3.1 Turn on each of the correction supplies.

5.1.4.3.2 Connect the current signal for each supply to a scope.

5.1.4.3.3 Start 'BoosterStopbandCorrect'.

5.1.4.3.3.1 Load the STORE or desired function for each set of corrections.

5.1.4.3.3.2 Check that the magnet currents follow the loaded commands.

5.1.4.3.3.3 Complete the appropriate section of C-A-OPM-ATT 5.22.b.

5.1.4.3.3.3.1 Note problems encountered in the comments area provided.

5.1.4.4 Booster Orbit Correction Checkout

Note:
This system used the Booster BPM system as well as the low field dipole in the Booster, the BPM's must be certified operational by a system specialist.

5.1.4.4.1 Confirm that the low field dipoles in the Booster are operational.

5.1.4.4.1.1 Turn on each of the devices listed in C-A-OPM-ATT 5.22.b.

5.1.4.4.1.2 Enter problems in the comments section provided.

5.1.4.4.2 Start the application 'BoosterOrbitControl'.

5.1.4.4.2.1 Load the STORE or desired function for orbit correction.

5.1.4.4.2.1.1 Note the harmonics for command and read backs in the spaces provided.

5.1.4.4.2.1.2 Comment on any large discrepancies between command and read back harmonics in the area provided.

5.1.4.5 Booster Main Magnet

Note:
A system specialist for the Booster Main Magnet system must sign off the Booster Main Magnet as operational prior to this checkout.

5.1.4.5.1 Start up the `BoosterMainMagnet' application.

5.1.4.5.1.1 Load the STORE or desired B(t) function.

5.1.4.5.1.2 Bring on the Booster Main Magnet Power Supply (see Note 8 above).

5.1.4.5.1.3 Use the application to display all of the signals listed in C-A-OPM-ATT 5.22.b.

5.1.4.5.1.4 Connect all of the XBAR signals for these signals and compare them to those displayed by BoosterMainMagnet.

5.1.4.5.1.5 Note any differences between displayed and MUX wave forms in the comments section of C-A-OPM-ATT 5.22.b.

5.1.4.6 Booster Tune Supplies

5.1.4.6.1 Start the application code 'BoosterTuneControl'.

5.1.4.6.2 Connect the current signals for the tune quads to a scope.

5.1.4.6.3 Load the STORE or desired function for the tune.

5.1.4.6.3.1 Check that the current signal follows the loaded function.

5.1.4.6.4 Complete the appropriate section of C-A-OPM-ATT 5.22.b.

5.1.4.6.4.1 Comment in the area provided.

5.1.4.6.5 Start 'BoosterChromControl'.

5.1.4.6.6 Repeat 5.1.3.4.6.1-5.1.3.4.6.3 above for the chromaticity supplies.

5.1.4.6.7 Complete the appropriate section of C-A-OPM-ATT 5.22.b.

5.2 AGS Power Supplies

5.2.1 Low Field Supplies

5.2.1.1 Turn all of the devices listed in section.

5.2.1.2 For each device, send the specified command and record the read backs in the spaces provided.

5.2.1.3 Check out the low field dipoles in the AGS:

5.2.1.3.1 Turn on all of the low field dipoles in the AGS ring,

5.2.1.3.2 send 1000 command to each supply,

5.2.1.3.3 note any supplies that are not regulating to within 10%,

5.2.1.3.4 send commands of 0 and -1000 and repeat 5.2.1.3.3, and

5.2.1.3.5 complete the appropriate section of C-A-OPM-ATT 5.22.a.

5.2.2 SEB Power Supplies

Note:
SEB supplies having ramp functions associated with them shall be tested with the ramp function turned off.

5.2.2.1 Turn on each of the supplies listed in the SEB power supply section of C-A-OPM-ATT 5.22.a and complete the checklist.

5.2.2.1.1 Comment on any supplies that are not regulated to within 10%, I the area provided (the read backs for these devices should be colored red on 'spreadsheet').

5.2.3 SEB and FEB extraction power supplies

5.2.3.1 Start the application 'AGSExtraction'.

5.2.3.1.1 Send the STORE or desired function to each device listed in the extraction section of C-A-OPM-ATT 5.22.a.

5.2.3.2 Turn each supply on.

5.2.3.3 Connect the MUX signal associated with the teach supply to a scope.

5.2.3.4 Compare the observed function to the loaded one. The application 'AGSExtracton' is used to read and load functions.

5.2.3.5 If the supplies follow the function check that the supply is okay on C-A-OPM-ATT 5.22.a.

5.2.3.6 If there is a problem, write specifics in the comment area provided.

5.2.3.7 Load the STORE or desired values into the FEB devices listed on C-A-OPM-ATT 5.22.a.

5.2.3.8 Turn on the FEB supplies.

5.2.3.9 Connect the current signals for each of the devices.

5.2.3.9.1 The G09 and H11 a and b bumps shall be half sine waves. They shall have a width of 7-8 milliseconds.

5.2.3.9.2 The G10 fast kicker has a fast rise time, and a width of 380μ seconds. It is also a half sine wave.

5.2.3.9.3 The H10 septum's current signal is a half sine wave with a width of 2 ms.

5.2.3.10 Complete the FEB section of C-A-OPM-ATT 5.22.a.

5.2.3.10.1 Note problems in the comment area provided.

5.2.4 SEB Ramped Supplies

5.2.4.1 Check the ramps for the devices listed on C-A-OPM-ATT 5.22.a and indicate whether or not they are working properly on the checkout sheet.

5.2.4.1.1 For each Ramped device, connect the analog signal for the ramp function output to a scope.

5.2.4.1.2 Send a known function to the ramp.

5.2.4.1.3 Connect the current signal for the associated device to a scope.

5.2.4.1.4. Turn the ramp on and observe that the current signal follows the loaded function.

5.2.4.1.5 Load a second known function.

5.2.4.1.6 Check that the current signal for the device follows the new function.

5.2.4.1.7 If 5.2.4.1.3-5.2.4.1.6 are satisfied then mark that the ramp is okay on C-A-OPM-ATT 5.22.a.

5.2.4.1.7.1 List any problems encountered in the comments area provided.

5.2.5 AGS Tune Supplies

5.2.5.1 Start the application code 'AGSTuneControl'.

5.2.5.2 Connect the current signals for the tune quads to a scope.

5.2.5.3 Load the STORE or desired function for the tune.

5.2.5.3.1 Check that the current signal follows the loaded function.

5.2.5.4 Complete C-A-OPM-ATT 5.22.a.

5.2.5.4.1 Comment in the area provided.

5.2.5.4.1.1 Start 'AGSChromeControl'.

5.2.5.4.1.2 Repeat 5.2.5.1-5.2.5.3 above for the chromatically supplies.

5.2.5.4.1.3 Complete the appropriate section of C-A-OPM-ATT 5.22.a.

6. Documentation

6.1 The attachments for this procedure will be held in a binder in the MCR and contains all of the completed work as well as a list of problems encountered.

6.2 The OC will report progress made for each shift to the next shift by documentation in the OC Log.

7. References

7.1 C-A-OPM, Chapters 6 and 8.

8. Attachments

8.1 C-A-OPM-ATT 5.22.a, "C-A Power Supply Checkout".

8.2 C-A-OPM-ATT 5.22.b, "Booster Power Supply Checkout".